<u>What Is Claimed Is</u>:

1.   A RAID apparatus for separating data according to
a RAID configuration definition and reading/writing the data
5   from/to a plurality of physical disk devices in parallel,
comprising:

a control unit for accessing said plurality of
physical disk devices according to RLU mapping based on said
RAID configuration definition upon an I/O request from a host
10   device;

a table for storing old RAID configuration
definition information which defines at least an old RAID
level and a number of old logical devices, and new RAID
configuration definition information which defines at least a
15   new RAID level and a number of new logical devices; and

a cache memory for temporarily storing data for
changing the old RAID configuration to the new RAID
configuration,

wherein said control unit reads out the data from
20   said plurality of physical disk devices to said cache memory
according to the RLU mapping based on said old RAID
configuration definition of said table, and writes the data
which was read out to said cache memory to said plurality of
physical disk devices according to the RLU mapping based on
25   said new RAID configuration definition of said table.

2.   The RAID apparatus according to Claim 1, wherein

said control unit performs RAID level conversion processing

by reading out the data from said plurality of physical disk

devices to said cache memory according to the RLU mapping

based on the RAID level of said old RAID configuration

5   definition, and writing the data which was read out to said

cache memory to said plurality of physical disk devices

according to the RLU mapping based on the RAID level of said

new RAID configuration definition.

10   3.   The RAID apparatus according to Claim 1, wherein

said control unit performs capacity increase processing by

reading out the data from said plurality of physical disk

devices to said cache memory according to the RLU mapping

based on said number of logical devices in said old RAID

15   configuration definition, and writing the data which was read

out to said cache memory to said plurality of physical disk

devices according to the RLU mapping based on said number of

logical devices in said new RAID configuration definition.

20   4.   The RAID apparatus according to Claim 1, wherein

said control unit executes conversion from said old RAID

configuration to said new RAID configuration sequentially and

manages the progress status thereof, as well as judges

whether an I/O request sent from said host device is for a

25   converted area during said conversion, executes said I/O

request using said new RAID configuration definition when the

I/O request is for a converted area, and executes said I/O

request using said old RAID configuration definition when the I/O request is for an unconverted area.

5. The RAID apparatus according to Claim 1, wherein said control unit converts RLBA based on the new RAID configuration definition to the host LBA, then reads out the data from said plurality of physical disk devices to said cache memory according to the RLU mapping based on said old RAID configuration definition using said host LBA, and writes the data which was read out to said cache memory to said plurality of physical disk devices according to the RLU mapping based on said new RAID configuration definition using said RLBA.

6. The RAID apparatus according to Claim 1, wherein said control unit converts said old RAID configuration into said new RAID configuration, and then deletes said old RAID configuration definition from said table.

7. The RAID apparatus according to Claim 1, wherein said control unit creates said new RAID configuration definition in said table according to the instructed parameters of the new RAID configuration definition and said old RAID configuration definition.

8. The RAID apparatus according to Claim 1, wherein said control unit acquires an area of said cache memory

corresponding to the conversion area, and then executes

conversion from said old RAID configuration into said new

RAID configuration sequentially.

5   9.   The RAID apparatus according to Claim 8, wherein

said control unit separates said conversion processing into

sections and executes the processing a plurality of times

when the area of said cache memory corresponding to said

conversion area cannot be acquired.

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10.   The RAID apparatus according to Claim 1, wherein

said control unit performs said RLU mapping according to a

strip depth and stripe size corresponding to the stripe of

said RAID configuration.

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11.   A logical device expansion method for a RAID

apparatus which separates data according to a RAID

configuration definition and reads/writes the data to a

plurality of physical disk devices in parallel, comprising

20   the steps of:

reading out the data from said plurality of

physical disk devices to a cache memory according to an RLU

mapping based on an old RAID configuration definition

information which defines at least an old RAID level and a

25   number of old logical devices; and

writing the data which was read out to said cache

memory to said plurality of physical disk devices according

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to an RLU mapping based on a new RAID configuration
definition information which defines at least a new RAID
level and a number of new logical devices.

5   12.   The logical device expansion method according to
Claim 11, wherein said reading step comprises a step of
reading out the data from said plurality of physical disk
devices to said cache memory according to an RLU mapping
based on the RAID level of said old RAID configuration
10 definition, and

       said writing step comprises a step of writing the data
which was read out to said cache memory to said plurality of
physical disk devices according to an RLU mapping based on
the RAID level of said new RAID configuration definition.
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       13.   The logical device expansion method according to
Claim 11, wherein said reading step comprises a step of
reading the data from said plurality of physical disk devices
to said cache memory according to an RLU mapping based on
20 said number of logical devices of said old RAID configuration
definition, and

       said writing step comprises a capacity increase step of
writing the data which was read out to said cache memory to
said plurality of physical disk devices according to an RLU
25 mapping based on said number of logical devices of said new
RAID configuration definition.

14. The logical device expansion method according to Claim 11, further comprising the steps of:

managing the progress status of executing conversion from said old RAID configuration into said new RAID configuration sequentially;

judging whether an I/O request sent from a host device is for a converted area during said conversion;

executing said I/O request using said new RAID configuration definition when the I/O request is for a converted area; and

executing said I/O request using said old RAID configuration definition when the I/O request is for an unconverted area.

15. The logical device expansion method according to Claim 11, wherein said reading step comprises a step of converting RLBA based on the new RAID configuration definition to a host LBA, and then reading out the data from said plurality of physical disk devices to said cache memory according to an RLU mapping based on said old RAID configuration definition using said host LBA, and

said writing step comprises a step of writing the data which was read out to said cache memory to said plurality of physical disk devices according to an RLU mapping based on said new RAID configuration definition using said RLBA.

16. The logical device expansion method according to

Claim 11, further comprising a step of deleting said old RAID

configuration definition after said conversion of said old

RAID configuration into said new RAID configuration.

5   17.   The logical device expansion method according to

Claim 11, further comprising a step of creating said new RAID

configuration definition in the table according to the

instructed parameters of the new RAID configuration

definition and said old RAID configuration definition.

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            18.   The logical device expansion method according to

Claim 11, further comprising a step of acquiring an area of

said cache memory corresponding to the conversion area, and

then executing conversion from said old RAID configuration

15   into said new RAID configuration sequentially.

            19.   The logical device expansion method according to

Claim 18, further comprising a step of separating said

conversion processing into sections and executing the

20   processing a plurality of times when the area of said cache

memory corresponding to said conversion area cannot be

acquired.

            20.   The logical device expansion method according to

25   Claim 11, further comprising a step of performing said RLU

mapping according to a strip depth and stripe size

corresponding to the stripe of said RAID configuration.